CLAIMS

1. A recombinant eukaryotic cell synthesizing functionally active phycocyanin or functionally active parts thereof.

2. A recombinant eukaryotic cell synthesizing holo-CpcA and/or holo-CpcB.

3. The recombinant eukaryotic cell as claimed in claim 1 or 2 expressing the heterodimeric PCB lyase plus Apo-CpcA and/or Apo-CpcB.

4. The recombinant eukaryotic cell as claimed in claim 3 further expressing a heterologous heme oxygenase and/or a heterologous ferredoxin oxidoreductase.

5. The recombinant eukaryotic cell as claimed in either of claims 3 or 4, characterized by one or more of the genes hox1, pcyA, cpcE, cpcF and cpcA.

6. The recombinant eukaryotic cell as claimed in claim 5 transformed with a vector comprising at least one insert with one of the following oligonucleotide sequences shown in one of SEQ. ID. No. 6 - SEQ. ID. No. 10 or with oligonucleotides, which hybridize with strands, which are complementary thereto.

7. The recombinant eukaryotic cell as claimed in any of claims 1 to 6, characterized in that at least one of the genes is regulated by an ADH promoter which is deleted upstream from -700 bp.

8. The recombinant eukaryotic cell as claimed in claim 7, characterized in that all the genes are regulated by an ADH promoter which is deleted upstream from -700 bp.

9. The recombinant eukaryotic cell as claimed in claim 7 or 8, characterized by an ADH promoter with the oligonucleotide sequence shown in SEQ. ID. No. 5 or with an oligonucleotide sequence hybridizing with the strand complementary thereto.

10. The recombinant eukaryotic cell as claimed in any of the preceding claims, characterized in that it is a yeast cell.

11. Yeast cell with the DSMZ admission number DSM 16134.

12. A vector comprising inserts coding for a heme oxygenase, a ferredoxin oxidoreductase, a heterodimeric PCB lyase and the Apo-CpcA or Apo-CpcB.

13. The vector as claimed in claim 12, characterized by inserts with the genes hox1, pcyA, cpcE, cpcF and cpcA, where the cpcA may also be replaced by cpcB.

14. The vector as claimed in claim 11, characterized by one or more of the oligonucleotides shown in one of SEQ. ID. No. 6 - SEQ. ID. No. 10 or with one of these sequences complementary strand hybridizing oligonucleotides.

15. The vector as claimed in any of claims 12 to 14, characterized in that at least one of the genes is regulated by an ADH promoter which is deleted upstream from -700 bp.

16. The vector as claimed in claim 15, characterized in that all the genes are regulated by an ADH promoter which is deleted upstream from -700 bp.

17. The vector as claimed in claim 15 or 16, characterized by an ADH promoter with the oligonucleotide sequence shown in SEQ. ID. No. 5 or with an oligonucleotide sequence hybridizing with the strand complementary thereto.

18. A vector with a nucleotide sequence shown in SEQ. ID. No. 14.

19. A method for preparing a phycocyanin or a functionally active part thereof, in particular holo-CpcA, or holo-CpcB comprising the following steps:
- transformation of a eukaryotic host cell at least with cpcA or cpcB;
- where appropriate addition of a phycocyanobilin (PCB) and/or of PCB lyase
- isolation of the phycocyanin, of the holo-CpcA and/or of the holo-CpcB from the host cell.

20. The method as claimed in claim 19, characterized in that there is additionally recombinant expression also of one or more of the genes hox1, pcyA, cpcE and/or cpcF.

21. The method as claimed in either of claims 19 or 20, characterized in that the endogenous heme concentration in the host cell is increased.

22. The method as claimed in claim 19 to 21, characterized by stimulation of endogenous heme metabolism in the host cell.

23. The method as claimed in claim 22, characterized by the use of a carbon source not fermentable by the host cell.

24. The method as claimed in any of claims 19 to 21, characterized by an inhibition of endogenous heme degradation in the host cell.

25. The method as claimed in any of claims 19 to 24, characterized by the increase in the glucose concentration in the medium of the host cell to a concentration which stimulates the activity of the ADH promoter.

26. The method as claimed in claim 25, characterized by the addition of at least 13% glucose.

27. The method as claimed in any of claims 19 to 26, characterized by a 2% ethanol concentration in the culture medium of the host cell.

28. The method as claimed in any of claims 19 to 27, characterized by a host cell as claimed in any of claims 1 to 11.

29. The method as claimed in any of claims 19 to 26, characterized in that the transformation takes place with the aid of a vector as claimed in any of claims 12 to 19.

30. A recombinant phycocyanin or functionally active parts thereof prepared as claimed in any of claims 19 to 29.

31. The recombinant phycocyanin or functionally active parts thereof as claimed in claim 30, characterized by a glycosylation.

32. The recombinant phycocyanin or functionally active parts thereof as claimed in either of claims 30 or 31, characterized in that the glycosylation is present at least one of position 6, 10 or 162 of the amino acid sequence.

33. The recombinant phycocyanin or functionally active parts thereof as claimed in any of claims 30 to 32, characterized in that the emission maximum is shifted into the longer-wavelength range by comparison with the native phycocyanin, in particular to the native holo-CpcA at pH 8.

34. A recombinant holo-CpcA with an emission maximum at pH 8 of 643 nm.

35. A fusion protein comprising a recombinant phycocyanin or functionally active parts thereof, in particular recombinant holo-cpcA, as claimed in any of claims 30 to 34.

36. An antibody or fragments thereof, characterized in that it specifically recognizes a recombinant phycocyanin as claimed in any of claims 30 to 34.

37. An antibody or fragments thereof, characterized in that it specifically recognizes functionally active parts of the recombinant phycocyanin as claimed in any of claims 30 to 34, in particular recombinant holo-CpcA.